New Records of Mysidacea and Euphausiacea from the Northeastern Pacific and Adjacent Areas[1]

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SINCE THE PUBLICATION of my tripartite report on the Mysidacea and Euphausiacea of the northeastern Pacific (1948*a*, 1948*b*, 1950), some additional collections of these crustaceans from this region have been made available to me. These collections are in three groups: (1) specimens collected by the King Crab Investigation of the U. S. Fish and Wildlife Service in the eastern Bering Sea in 1941, principally from the stomachs of codfish and pollock; (2) specimens collected at the Arctic Research Laboratory at Point Barrow, Alaska, from 1948 to 1952, principally by G. E. MacGinitie and Ira L. Wiggins who were sponsored by research contracts from the Office of Naval Research to Johns Hopkins University and the California Institute of Technology; and (3) specimens collected by various persons, including myself, at random spots from Alaska to California after 1945. Many of the records are within the established range of the species, but even these are of importance because not much is known about these animals in the Pacific and, especially, in Alaskan waters. Some of the records below are extensions of the previously known ranges. Two new species are described, and a genus and several species previously described are placed in synonymy. In addition, lectotypes are designated for the species previously described by me (*op. cit.*) from this region.

To keep this paper as short as possible, rather than give the descriptions and full synonymy, reference will be made only to the original descriptions and to my previous study or to the monograph of Tattersall (1951).

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Boreomysis nobilis Sars

Boreomysis nobilis G. O. Sars, Arch. Math. Naturv. 4: 428, 1879.

——— ——— Tattersall, U. S. Natl. Mus., Bul. 201: 47, 243, fig. 6, 1951.

SPECIMENS EXAMINED: *Arctic Research Laboratory:* No.?, Point Barrow, Alaska, Sept. 27, 1948; MacGinitie, collector. Four specimens. The largest specimen, an immature female, was 38 mm. long.

DISCUSSION: MacGinitie supplied the following notes: "Specimens collected near shore after several days of offshore wind followed by upwelling. [Body] translucent white with a red stripe (gut) down middle of back, a red stomach and mouth region. Eyes metallic crimson."

Previous records of this species have been confined to the subarctic Atlantic Ocean and the adjacent regions of the Arctic Ocean; it has been reported as far south as Newfoundland (Tattersall, 1939) and as far north as 77°N. on both coasts of Greenland (Stephensen, 1933, 1943). Its westernmost record until now was the western sounds leading into Baffin Bay (Tattersall, 1939).

Archaeomysis grebnitzkii Czerniavsky

Archaeomysis grebnitzkii Czerniavsky, St. Petersbourg Nat., Trudy 12: 73, 1882; 18: pl. 30, figs. 17–24; pl. 32, figs. 19–20, 1887.

——— ——— Banner, Roy. Canad. Inst., Trans. 26: 370–374, pl. 5, figs. 6a–i, 1948. [Redescribed.]

——— ——— Tattersall, U. S. Natl. Mus.,

Bul. 201: 81–86, figs. 21–22, 1951. [Redescribed.]

SPECIMENS EXAMINED: Numerous adult specimens of both sexes in sand in intertidal zone, Pismo Beach, Calif. (about 50 miles north of Point Conception), Nov., 1945; A. H. Banner, collector. The specimens were found burrowing in the sand in the wave-washed portion of the beach.

DISCUSSION: The specimens listed above and those previously examined and reported upon agree quite well with Tattersall's redescription and with his criteria for the separation of *A. maculata* (Holmes) from *A. grebnitzkii*. However, in both groups of specimens the posterior dorsal tooth of the fifth abdominal segment was present, a characteristic Tattersall reported to be unique to *A. maculata*. Therefore, reliance should not be placed upon that to separate the two species.

My previous records for the species reached only to the southern portion of the state of Washington, and those of Tattersall reached only to Half Moon Bay, immediately south of San Francisco, California; the present record, therefore, is the most southerly for the species. It is noteworthy that, during the month in which this collection was made at Pismo Beach, many other beaches to the south, especially in the Los Angeles area, were investigated and neither *A. grebnitzkii* nor *A. maculata* were found.

Mysis oculata (Fabricius)

Cancer oculatus Fabricius, Fauna Groenlandica, pp. 245–246, 1780.

Pugetomysis litoralis Banner, Roy. Canad. Inst., Trans. 27: 105, pl. 6, figs. 18a–k, 1948.

Mysis oculata Tattersall, U. S. Natl. Mus., Bul. 201: 165–167, fig. 61, 1951. [Redescribed.]

SPECIMENS EXAMINED: *Arctic Research Laboratory:* No. 492, washed ashore near Point Barrow, Alaska, Sept. 22, 1949; MacGinitie, collector. One immature female.

No. 659, plankton tow off Point Barrow, Alaska, Oct. 31, 1949; MacGinitie, collector. About 20 specimens, immature males and females, mature females.

No. 660, plankton tow off Point Barrow, Alaska, in churning water, evening, Sept. 1, 1949; MacGinitie, collector. Four immature males and females.

No.?, plankton tow off Point Barrow, Alaska, July 23, 1948; MacGinitie, collector. Ten larval forms.

No. 489, beach, Point Barrow, Alaska, July 24, 1950; Wiggins, collector. Five immature males and females.

Red Station 2. Dredged at 70°08′N., 143°-54′W., 1 specimen.

Red Station 3. Dredged at 70°03′N., 145°-14′W., approximately 150 specimens.

Red Station 4. Dredged at 70°12′N., 145°-55′W., 6 specimens.

Red Station 5. Dredged at 70°11′N., 146°-15′W., 177 specimens.

Red Station 6. Dredged at 70°15′N., 146°-50′W., approximately 150 specimens.

Red Station 7. Dredged at 70°26′N., 147°-55′W., approximately 100 specimens.

Red Station 8. Dredged at 70°31′N., 148°-50′W., 26 specimens.

Red Station 10. Dredged at 70°34′N., 150°-15′W., approximately 100 specimens.

Red Station 11. Dredged at 70°43′N., 150°-59′W., approximately 100 specimens.

Red Station 12. Dredged at 70°40′N., 151°-50′W., 17 specimens.

Red Station 15. Dredged at 70°57′N., 153°-15′W., 1 specimen.

Red Station 16. Dredged at 70°57′N., 154°-16′W., 5 specimens.

Red Station 18. Dredged at 71°13′N., 155°-48′W., 15 specimens.

The stations of the "Red" were taken between August 9 and 12, 1953. The depths varied from 9 to 42 feet; the surface temperatures from 2.6°C. to 4.8°C.; the bottom temperatures from −3.5°C. to 3.2°C.; the surface salinity from 8.87 o/oo to 23.48 o/oo; the bottom salinity from 24.33 o/oo to 30.61 o/oo; the bottoms were of mud, sand, gravel,

and clay. Further details on the stations may be found in Wilimovsky (1953).

DISCUSSION: Specimens apparently of this species are represented in the collection only by mature females and immature specimens of both sexes. The immature males are about 10 millimeters long, whereas the two mature females are over 20 millimeters long. The specimens agree well with the described characteristics of *M. oculata*, except that the pleopods of the males are obviously immature.

In these males all pleopods save the fourth are uniramous, and in the fourth the exopod is divided into only three articles, whereas the endopod has no subdivisions. However, in adult *M. oculata* both the third and fourth pleopods are biramous, the third with an exopod of five articles and the fourth with an exopod of seven articles. Because of the close similarity of these specimens to the descriptions of *M. oculata*, and because of the much greater size of the mature females, it was decided that the males were immature.

This condition is the same as that of the immature males described by me as *Pugetomysis litoralis*. I had presumed from the fourth pleopods of these specimens that they were almost mature. Since examining the Point Barrow specimens, I have re-examined the specimens in the type lot, and I can find no differences that could be considered of major importance. Therefore, *P. litoralis* is a synonym of *M. oculata*, and the genus *Pugetomysis*, erected to contain only that species, is a synonym. As a consequence, the type will not be deposited in the U. S. National Museum.

Mysis oculata is circumpolar in distribution and has been reported from the arctic coasts of North America, Europe, and Asia; it has been reported from the Arctic Ocean on either side of Bering Straits and as far south as Kiska, Alaska.

The specimens originally reported as *P. litoralis* came from Friday Harbor, Washington, and represent the first record of the species in the Pacific Ocean proper and the first record of the genus or species along the western coast of subtemperate and temperate North America.

Mysis relicta Lovén

Mysis relicta Lovén, Svenska Vetensk. Akad., Öfversigt af . . . forhandl., p. 285, 1862.
——— ——— Tattersall, U. S. Natl. Mus., Bul. 201: 167–168, fig. 62, 1951.

SPECIMENS EXAMINED: *Arctic Research Laboratory:* No. 489, beach, Point Barrow, Alaska, Sept. 24, 1950; Wiggins, collector. Two specimens, immature.

No. 665, plankton tow off Point Barrow, Alaska, Sept. 30, 1949; MacGinitie, collector. About 500 specimens, immature.

No.?, Elson Lagoon near Point Barrow, Alaska, Sept. 1, 1949; MacGinitie, collector. About 50 specimens, immature.

No.?, Elson Lagoon near Point Barrow, Alaska, July 28, 1950; MacGinitie, collector. Five specimens, immature.

No.?, Nuwuk Pond near Point Barrow, Alaska, Aug., 1952 (chlorinity 1.3 o/oo); John Mohr, collector. Twelve specimens, immature.

DISCUSSION: *Mysis relicta* is distinguished from the very closely related *M. oculata* chiefly by a more shallow and more pointed indentation on the posterior margin of the telson and a broader squame of the second antenna. However, these conditions are found in the larval form of *M. oculata* as well. In view of the work of Olafsson (1918) which indicated that *M. relicta* might not be produced by any inherited differences from the stem form but merely by the lesser salinity of their environment, I am not personally convinced of the validity of the species. However, until more definite information is available I will accept the decision of previous workers that *M. relicta* is a separate and valid species.

The telsons of the specimens listed are almost identical to those described for *M. relicta*, but the antennal squame is more like that of *M. oculata*, almost six times as long as

broad. Because of the small size and the sexual immaturity of these specimens they possibly could be interpreted as young *M. oculata*. However, inasmuch as the cleft of the telson in specimens of *M. oculata* of similar size had the adult configuration, the present specimens were considered to be young of *M. relicta*.

Like *M. oculata*, *M. relicta* is circumpolar in distribution and occurs not only in brackish and fresh water lying near the present Arctic Ocean but also as far south as the lakes left by the continental ice sheets, such as the Great Lakes of North America. Dr. Mohr, in a personal communication, has described the pond where he collected these specimens at Point Barrow:

> There extends northeast from Pt. Barrow base for about seven miles a peninsula . . . called Nuwuk. On the tip there are several shallow pools and a larger one roughly a block long and at least 17 feet deep near the center. . . . Nuwuk pond is possibly a hundred yards from the present seashore. Between the main pond and the sea is a smaller pond which would about halve that distance, and very clear and apparently quite recent channels connect the smaller to the main pond. . . . I had the strong impression that Nuwuk Pond was of recent separation from the sea. I think [that the geologists of the party were inclined to agree with this].

This species has been reported previously from Arctic Alaska.

Neomysis rayi[3] (Murdock)

Mysis rayii Murdock, U. S. Natl. Mus., Proc. 7: 519, 1885.
Neomysis rayii Banner, Roy. Canad. Acad., Trans. 27: 78–82, pl. 2, fig. 12, 1948.
Neomysis rayii Tattersall, U. S. Natl. Mus., Bul. 201: 181–186, figs. 68–71, 1951.

SPECIMENS EXAMINED: *Arctic Research Laboratory:* No. 532, beach, Point Barrow, Alaska, Sept. 28, 1950; Wiggins, collector. One specimen.

No.?, plankton tow near shore, July 13, 1950; MacGinitie, collector. One specimen, broken (identification not certain).

King Crab Investigation: No. C-109, stomach of *Gadus macrocephalus*, Point Moller, Alaska, 20–23 fathoms, June 5, 1941. One mature male 32 mm. long.

DISCUSSION: These records add nothing to the known range, as Point Barrow is the type locality and the species have been previously reported from the Bering Sea region.

Neomysis kadiakensis Ortmann

Neomysis kadiakensis Ortmann, U. S. Natl. Mus., Proc. 34: 8, 1908.
——— ——— Banner, Roy. Canad. Inst., Trans. 27: 83, pl. 3, fig. 13, 1948.
——— ——— Tattersall, U. S. Natl. Mus., Bul. 201: 192–194, fig. 75, 1951.

SPECIMENS EXAMINED: *King Crab Investigation:* No. C-87, Akutan Bay, Alaska, April 27, 1941. Three specimens.

DISCUSSION: These specimens are from slightly west of the previous northern and western record, that of Ortmann for the type specimens from Kodiak Island, Alaska.

Neomysis awatschensis (Brandt)

Fig. 1

Mysis awatschensis Brandt, Middendorf's Reise . . . 2(1): 126, 1851.
Neomysis awatschensis Zimmer, Fauna Arctica, 3: 468, 1904.
Neomysis nigra Nakazawa, Annot. Zool. Japonensis 7(4): 248, 1910.
Heteromysis intermedia Czerniavsky, St. Petersbourg Nat., Trudy 13: 35, 1882.
Neomysis intermedia Zimmer, Fauna Arctica 3: 469, 1904.
Neomysis isaza Marukawa, Annot. Oceanog. Rech. 2: 6, 1928.
Neomysis mercedis Holmes, Calif. Acad. Sci., Proc. II, 6: 199, 1897.

[For a full listing of all citations to these nominal species, see Tattersall, 1951: 187–191.]

[3] The terminal "i" must be dropped from this patronymic according to the International Rules of Zoological Nomenclature as amended in Paris in 1948 —see Bul. Zool. Nomen. 4: 68, 1950.

SPECIMENS EXAMINED: Naknek River, Alaskan Peninsula (Bristol Bay, approximately 59°N., 157°W.), low tide, near shore, July 11, 1946; Chester R. Mattson, collector; specimens loaned by Dr. J. E. Lynch, University of Washington. About 50 specimens.

DISCUSSION: The animals of this complex, described as five different species and more recently resolved to three species (*N. awatschensis*, *N. intermedia*, and *N. mercedis*), are known to extend around the rim of the North Pacific from San Francisco, California, to the coasts of Japan and China. *N. mercedis* reached from San Francisco Bay to the waters of southern British Columbia; *N. intermedia* from south central Alaska and Bering Island to the coasts of Siberia, Japan, and China; and *N. awatschensis* was known only from Kamchatka (Tattersall, 1951: 190, in his distributional lists forgot to mention the type locality, Awatscha Bay in Kamchatka), Japan, and China. All are known to inhabit brackish water, and in Washington, at least, *N. mercedis* penetrates into fresh-water lakes (Banner, 1948*b:* 75).

These three forms, accepted as separate species, have been known to be closely related. Tattersall in 1932 (p. 321) and again in 1951 (p. 187 *et seq.*) remarks upon this but gives criteria by which the species may be separated. The specimens listed above from the Bering Sea were somewhat intermediate in some of these criteria and have caused me to consider again, on the basis of the variations observed in specimens from Washington and Alaska, the validity of the separation of the three species.

Tattersall's criteria for the separation of the three species are listed below, together with notes on the specimens from Washington and Alaska.

Size: Tattersall states that mature *N. awatschensis* are 10 millimeters long, whereas *N. mercedis* are 15 millimeters long. However, some mature specimens from Washington known as *N. mercedis* are 11 millimeters long. The size of *N. intermedia* was not given by Tattersall, but specimens from Alaska approaching that species are 10 millimeters long and mature.

Color: Tattersall states that *N. awatschensis* is black and *N. mercedis* "is certainly not black." Observations on living specimens originally identified as *N. mercedis*, both those collected so recently as to have the color unchanged and those kept alive in aquaria, have not shown any jet-black individuals, but the color was found to range from almost transparent to a condition where the chromatophores were sufficiently expanded to make the individual almost black. In aquaria it was found that the color of the individuals changed with their environment. Several specimens were found that were pale green in color. This variability in the color pattern was reminiscent of *Acanthomysis sculpta* (Tattersall), which was found to vary from transparent, through sandy (and green), to jet black. To my knowledge there are no color notes on *N. intermedia*.

Rostral plate: N. mercedis is supposed to have a quadrangular rostral plate, *N. intermedia* a rounded rostral plate, and *N. awatschensis* a pointed rostral plate. The forms from Washington and from Alaska show variation in this plate, with only a few showing even an approximation of the quadrilateral condition and the rest varying from broadly rounded to narrowly rounded. In none was the rostrum pointed; however, those in which the tip was narrowly rounded certainly approached the pointed condition.

Antennal squame: This is supposed to be 8 times as long as broad in *N. mercedis* and *N. awatschensis* but 10 times as long as broad in *N. intermedia*. In some of the specimens from Washington the squames are slightly longer than 8 times as long as broad, while in many of the specimens from Bristol Bay the squames are about 9 times as long as broad.

Eyes: In *N. mercedis* and *N. intermedia* the entire eyestalk is 1.5 times as long as the cornea is broad, with the cornea occupying less than 0.5 the length of the entire stalk

and with the breadth of the peduncle equal to 0.4 of its length. In *N. awatschensis* the entire eyestalk is slightly less than 1.5 times as long as the cornea is broad, with the cornea occupying 0.5 the length of the entire stalk, and the peduncle is 0.5 as wide as the stalk is long. The specimens examined agree with *N. mercedis* and *N. intermedia*.

Thoracic endopods: Tattersall reports that the sixth joint of the thoracic endopods is divided into 8–10 secondary joints in *N. mercedis*, into 7–11 joints in *N. intermedia*, and into 6–8 joints in *N. awatschensis*. Smaller specimens of *N. mercedis* from Washington have 6–8 joints, whereas the larger have 8–10; specimens from Alaska approaching *N. intermedia* have 7–10 joints.

Fourth pleopods of the males: In *N. mercedis* and *N. awatschensis* the terminal article of the outer branch of the fourth pleopods of the males is supposed to be 0.25 the length of the proximal joint and definitely shorter than the terminal setae, whereas in *N. intermedia* the terminal article is 0.5 the length of the proximal and longer than the setae. However, in mature specimens from Washington the terminal article is 0.3 to 0.2 the length of the proximal, whereas immature specimens have the proportions given for *N. intermedia*.

Telson: Tattersall reports the telson to be similar in *N. mercedis* and *N. intermedia*, being twice as long as broad, the apex 0.2 the breadth of the base and the lateral spines shorter than the spaces between their bases; the only difference is that in *N. mercedis* there are 15 lateral spines (as shown by Tattersall in fig. 72), whereas in *N. intermedia* there are 13–21 lateral spines. He reports that the telson of *N. awatschensis* is 1.75 times as long as broad, the apex is 0.25 the breadth of the base, and the posterior of the 17–21 lateral spines are longer than the spaces between their bases. In the specimens from fresh water from Washington the tip of the telson is about 0.12 the breadth of the base, but in some of the more brackish-water specimens from Washington and Alaska the tip is 0.25 to 0.2

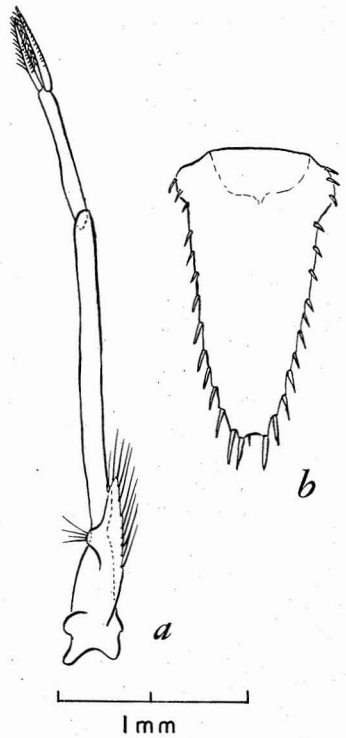

FIG. 1. *Neomysis awatschensis* (Brandt), specimen from Naknek River, Alaska. *a*, Fourth pleopod of male; *b*, telson, showing extreme condition of the spines. (Both drawings to the same scale.)

the breadth of the base. The number and length of the lateral spines are also variable, even those from the same locality; for example, some of those from Naknek River had spines longer than the spaces between their bases, therefore more like *N. awatschensis*, whereas in others the spines were shorter, like the other two species. The length-breadth relationship showed similar variation.

With this summation it can be seen that the three species were separated by rather small differences, but such differences, were they to remain constant, would have been adequate for the separation of the species. However, the specimens examined showed all these characteristics to be variable beyond the limits set for the separation of the three species. The sole exception may be found in the rather slight differences reported for the eyes, and

on the closely related *N. rayi* (Murdock) this was shown to be an unreliable characteristic. Probably the most firm of the criteria might be found in the shape of the rostral plate and the fourth pleopods of the male. However, it was precisely these characteristics again that were found to be without worth in the attempted separation of *N. rayi* from *N. franciscorum*. In fact, the differences in this complex parallel the differences found between the warm-water *N. franciscorum* (as it was previously known) and the colder-water *N. rayi*.

Unfortunately, the collections do not permit the complete removal of all differences, but when it is considered that there are stretches of the coast of the North Pacific hundreds of miles long where the species must exist but where no collections have ever been made, it is logical to presume that complete intergradations between the various types could be found.

It is for these reasons that *N. mercedis* and *N. intermedia* have been placed in synonymy to *N. awatschensis*.

Acanthomysis pseudomacropsis (Tattersall)

Neomysis pseudomacropsis Tattersall, Contrib. Canad. Biol. 8: 94–97, figs. 7a–b, 8a–f, 1933.

Acanthomysis pseudomacropsis Banner, Roy. Canad. Inst., Trans. 27: 89, 1948.

——— ——— Tattersall, U. S. Natl. Mus., Bul. 200: 217, figs. 91, 92, 1951.

SPECIMENS EXAMINED: *King Crab Investigation:* No. C-109, stomachs of *Gadus macrocephalus*, Point Moller, Alaska, May 6, 1941. Two specimens from separate stomachs.

No. C-117, stomach of *Theragra chalcogramma*, Cape Seniavin, Alaska, May 8, 1941. Twenty specimens.

DISCUSSION: Previous records of this species have extended from Washington to the coast of Siberia; these records, therefore, do not extend the range.

Acanthomysis sculpta (Tattersall)

Neomysis sculpta Tattersall, Contrib. Canad. Biol. 8: 197–200, figs. 9a–b, 10a–d, 11a–b, 1933.

Acanthomysis sculpta Banner, Roy. Canad. Inst., Trans. 27: 97–99, 1948.

——— ——— Tattersall, U. S. Natl. Mus., Bul. 201: 248, 1951.

SPECIMENS EXAMINED: Fifteen specimens from Pismo Beach, California (about 50 miles north of Point Conception), from the sand in the intertidal zone, Nov., 1946; A. H. Banner, collector.

DISCUSSION: As this species is known from Vancouver Island, Canada, to La Jolla, California, this record merely fills in part of the range.

Acanthomysis alaskensis n. sp.
Fig. 2

DESCRIPTION: Rostrum triangular, acute, with tip reaching almost to the proximal portion of cornea of eye; dorsal surface straight in profile. Anterolateral corners of carapace produced and acute.

Eyes large, with peduncle short and heavy, broader than long. Inner superior surface of peduncle with poorly developed triangular papilla. Cornea expanded, dorsoventrally compressed and subovate in lateral view.

Antennular peduncle showing usual sexual dimorphism, in males with distal article heavier than in females and bearing well-developed *process masculinus*. Basicerite of antenna bearing a small but acute tooth. Antennal peduncle reaching only to middle of last article of antennular peduncle. Squame twice as long as antennular peduncle, six times as long as broad; distal twentieth demarked by feeble articulation.

Labrum with acute anterior process.

Protopodite of first thoracic leg laterally expanded so that exopod and endopod are some distance removed from each other, and bearing well-developed, lobe-like endite. Propodi of third to eighth thoracic legs with 6

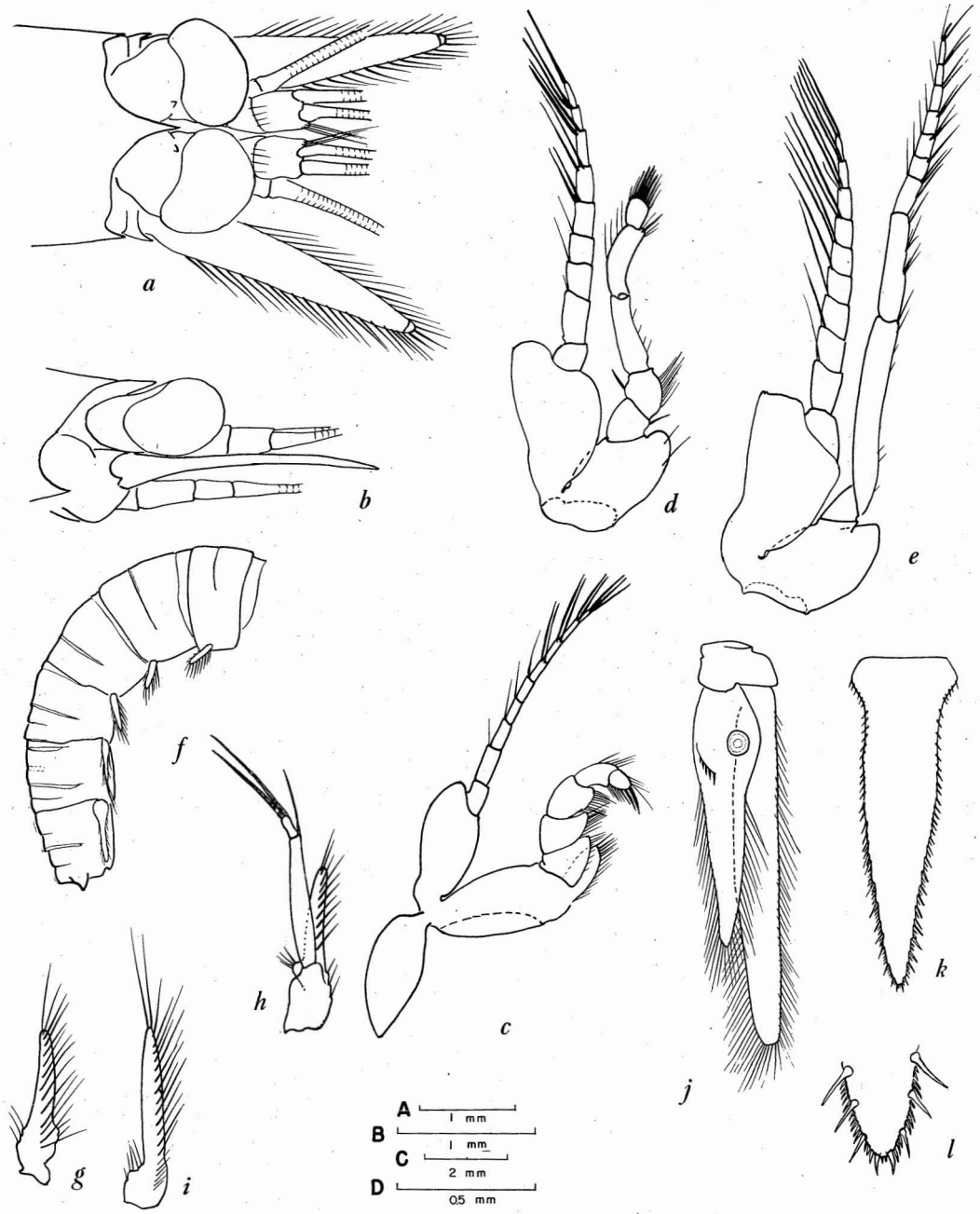

FIG. 2. *Acanthomysis alaskensis*, n. sp. *a*, Anterior region, dorsal aspect; *b*, anterior region, lateral aspect; *c*, first thoracic leg; *d*, second thoracic leg; *e*, seventh thoracic leg; *f*, abdomen, lateral aspect; *g*, third pleopod, male; *h*, fourth pleopod, male; *i*, fifth pleopod, male; *j*, uropod; *k*, telson; *l*, tip of telson. All drawings except *g*, *h*, and *i* from a mature female. (*a*, *b*, *j*, *k*, scale A; *c*, *d*, *e*, *g*, *h*, *i*, scale B; *f*, scale C; *l*, scale D.)

to 8 secondary articulations. Armature of basal plate of exopod variable.

Terga of first five abdominal somites bearing transverse folds somewhat similar to those described for *Acanthomysis davisi* Banner (1948*b*: 96). Sixth abdominal segment with three folds that are discontinuous dorsally; anterior pair set on a slight angle to transverse line of body and poorly developed; posterior two pairs transverse to body and well developed.

Telson slightly over twice as long as the sixth abdominal segment, triangular in shape with anterior lateral margins concave, middle and posterior lateral margins straight to slightly convex. Telson 3 times as long as broad at base, with breadth at tip one-twentieth breadth of base. Spines on basal half of lateral margins more or less regularly placed and of subequal lengths; larger spines of posterior half of lateral margins separated from each other by groups of 3 to 5 much shorter spines; penultimate lateral spines with tips reaching beyond tip of telson; final spines very slightly longer than tip is broad and separated by 2 very short spines.

Inner uropod reaching almost to end of telson and bearing 4 to 5 spines near statocyst; outer uropod 1.5 times length of inner.

Only fourth pleopods of male biramous, with tip of exopod reaching slightly beyond end of fifth abdominal segment. Proximal article of exopod 4.5 times length of distal and bearing a single strong spine; distal article bearing 2 strong spines that are 4 times length of distal article. Fifth pleopod of males 0.8 as long as fourth.

SPECIMENS EXAMINED: Type specimen: A submature male, 19.7 mm. long, collected by the King Crab Investigation, haul C-117, June 8, 1941, from the stomach of *Theragra chalcogramma* (Pallas) (Alaskan pollock), taken off Cape Seniavin on the Alaskan Peninsula (about 160°W.) in 23–26 fathoms. U. S. National Museum 95638.

Paratypes: Many others collected with type, some in semidigested condition. Five others also collected by the King Crab Investigation at Point Moller, Alaska, from the stomachs of cod.

DISCUSSION: These specimens were interpreted to be immature on the basis of characteristics of the female, not the male, for the females of size similar to the type did not have their oöstegites fully developed. On the other hand, it may be that the males are mature but reach a smaller size at maturity than do the females.

This species belongs to the group in this genus that have the abdomens with dorsal folds in the chitin: *A. mitsukurii* (Nakazawa) (1910: 250), *A. stelleri* (Derzhavin) (1913: 202), *A. davisi* Banner (1949: 95), *A. costata* (Holmes) (1900: 221), *A. sculpta* (Tattersall) (1933: 197), and *A. borealis* (described in this paper). *A. mitsukurii* can be distinguished from this species and from all other species in the group by the presence of small denticles on the folds of the abdomen, as well as by other characteristics. *A. sculpta* can be distinguished by the presence of four large spines on the tip of the telson and by the lack of a strong bristle on the basal article of the exopod of the fourth pleopods of the male. *A. borealis* is easily separated by the rounded tip of the telson and by the uniform series of spines on its distal tenth.

However, this species and the remaining three species, *A. costata*, *A. stelleri*, and *A. davisi*, are most obviously closely related. *A. costata* and *A. davisi* are both smaller species found in more southern waters, whereas *A. stelleri* and *A. alaskensis* are larger northern forms. The characteristics that will serve to separate them are given in Table 1.

From the examination of this table it will be seen that the species have much in common and that the diagnostic characteristics —primarily the rostrum, eyes, antennal squame, abdominal grooves, shape, and armature of the telson—are small differences in proportions in parts that are known in other species to be variable. The fourth pleopods of the male show less difference than is found between the northern and southern races of *Neomysis rayi*.

TABLE 1
CHARACTERISTICS WHICH DIFFERENTIATE THE SPECIES IN THE *Acanthomysis costata* GROUP

CHARACTERISTIC	*A. alaskensis*	*A. stelleri**	*A. costata*†	*A. davisi*
Size	About 20 mm.	About 20 mm.	8 mm.	9–11 mm.
Rostrum	Acute; reaching almost to end of ocular peduncle	Not as acute as *A. alaskensis;* reaching to middle of ocular peduncle	"short . . . pointed"	Subacute; not reaching to middle of ocular peduncle
Cornea	Dorsoventrally compressed; laterally broadened	Rounded (?)	Rounded (?)	Rounded to slightly compressed; not markedly laterally broadened
Antennal squame	7 times as long as broad; 2 times length of antennular peduncle	7 times as long as broad; 1.5 times length of antennular peduncle	5 times as long as broad; 1.3 times length of antennular peduncle	5 times as long as broad; 1.3 times length of antennular peduncle
Propodi of thoracic legs 3–8	6–8 secondary articles	4–6 secondary articles	4–5 secondary articles	4–5 secondary articles
Rugae of abdominal somites				
1	1 fold	2 folds, discontinuous dorsally	3 folds	2 folds, 1st slight
2	1 fold	2 folds, discontinuous dorsally	2 folds	2 folds, 1st slight
3	1 fold	3 folds, discontinuous dorsally	2 folds	2 folds, 1st slight
4	3 folds	2 folds, discontinuous dorsally	2 folds	3 folds
5	3 folds, 2 discontinuous dorsally	2 folds, 1 discontinuous dorsally	2 folds	3 folds, 2 discontinuous dorsally
6	3 folds, all discontinuous dorsally	1 fold, continuous dorsally	2 folds, first projecting as triangular plate, second continuous	3 folds, all discontinuous dorsally
Telson				
length/length 6th abdominal segment	2/1	1.5/1	2/1	2/1
length/breadth at base	3/1	2.5/1	2.5/1	2.5/1
breadth at tip/ breadth at base	1/20	1/6	1/15	1/40
penultimate long lateral spines	Reaching beyond tip of telson	Reaching beyond tip of telson	Not reaching to tip of telson	Reaching about mid-length of telson
posterolateral spines	Length equal to breadth of telsal tip	Length equal to breadth of telsal tip	Length equal to twice breadth of telsal tip	Telsal tip so different that comparison not valid
4th pleopods of male exopod				
basal article	4.5 times length distal article	Undescribed	5 times length distal article	4.5 times length distal article
terminal setae	4 times length distal article	Undescribed	3 times length distal article	3 times length distal article

* Comparison based on Derzhavin's figures and short description; the telson shown by Tattersall (1951: 212, fig. 88) does not agree with that shown for the type species.

† Comparison based on Holmes's original description (1900: 221) and upon the more adequate redescription by Tattersall (1932: 327). The specimen depicted by Hansen (1913: 177) showed a telson with the terminal spines like *A. sculpta* (Tattersall), not *A. costata.*

With the geographic variation of *Neomysis rayi* and *N. awatschensis*, members of a closely related genus, in mind and viewing the relatively minor differences between the species of the *Acanthomysis costata* group, I am of the opinion that this complex, too, may represent only a single species with various geographic races. However, as I have been able to find no variation in those specimens that I have studied nor have variations been reported by workers from other of these species, and as the characteristics as they are now given are sufficient to separate the four forms, I have decided for the time to maintain them as four species.

Acanthomysis borealis n. sp.

Fig. 3

Acanthomysis sp. Banner, Roy. Canad. Inst., Trans. 27: 101–102, pl. 6, figs. 17a–d, 1949.

DESCRIPTION: Anterolateral corners of the carapace produced and acute. Rostrum triangular with acute tip reaching only to basal portion of ocular peduncle.

Eyes similar to those of *A. sculpta* (Tattersall), 1.3 times as long as broad; corneas occupying distal 0.4, subhemispherical. Peduncle with very short dorsal papilla.

Antennular peduncle 1.5 times length of eyes, slender, with first article slightly less than twice as long as broad. Basicerite of antenna with small but acute tooth; peduncle reaching only to end of first antennular article; squame 7 times as long as broad, with distal 0.04 separated by usual articulation.

Labrum with acute anterior process. Mouthparts usual.

Endopods of third to eighth thoracic legs with 5–7 secondary articulations in propodi; dactyli about 0.5 the diameter and length of distal propodal article. Basal plates of exopods with or without denticle.

Abdomen with following grooves and folds:

Segment 1: single fold in middle; two rounded grooves;
Segment 2: single fold in middle; posterior groove poorly defined;
Segment 3: same as segment 2;
Segment 4: single fold in middle; posterior groove better defined;
Segment 5: heavy rounded ridge in middle, discontinuous over midline and projecting on either side of midline as rounded lobes; posterior to middle ridge a heavy fold, almost discontinuous over midline; near posterior margin another rounded ridge and groove, also discontinuous; posterior margin projecting over base of segment 6 as rounded lobe;
Segment 6: similar to segment 5, except ridges and folds are heavier and discontinuous over midline.

Telson 1.8 times length of sixth abdominal segment, 3.5 times as long as broad. Lateral margins anteriorly convex for short distance, then concave, convex again in middle, and in posterior half slightly concave. Tip so narrowly truncate and meeting rounded lateral margins at such an angle that it at first appears rounded. Spines of anterior half of lateral margins subequal in length; those from middle to near tip alternating between longer spines and groups of 2–6 shorter spines; in posterior tenth spines again subequal in length and 0.5 to 0.66 length of long spines in preceding portion. Posterolateral spines of tip slightly longer than lateral spines adjacent; median terminal spines 0.5 length of posterolateral spines.

Inner uropod 0.7 length of outer, slightly shorter than telson and bearing four spines near statocyst.

SPECIMENS EXAMINED: Type specimen: A mature female 19 mm. long collected from the stomach of a cod by the U. S. Fish and Wildlife King Crab Investigation, No. C-108, off Port Moller, Bristol Bay, Alaska, in 20–22 fathoms, May 6, 1941. U. S. National Museum 95639.

Paratype: an immature female, 15.5 mm. long, same data as type.

DISCUSSION: These specimens agree well with the specimen from Olga Bay, Kodiak

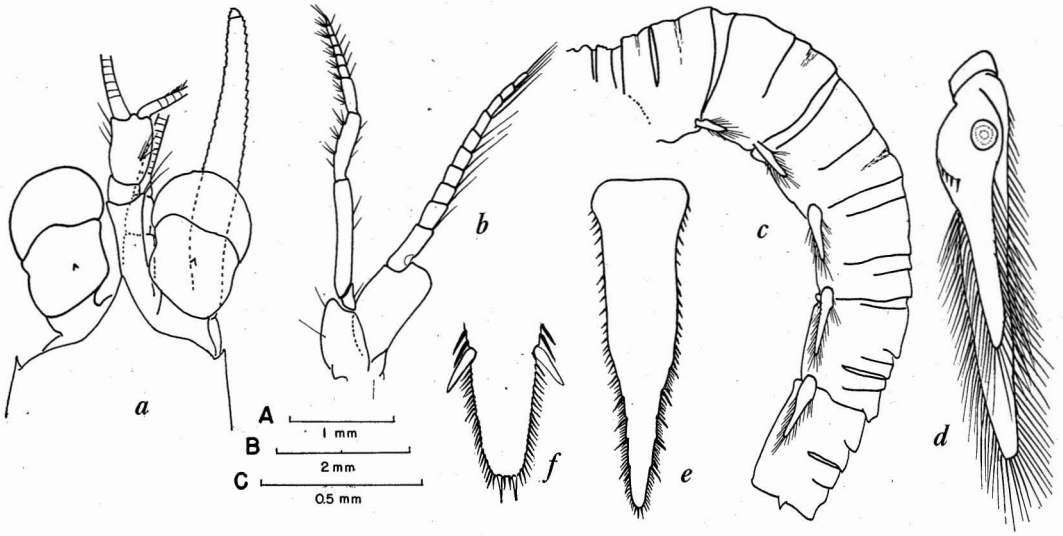

FIG. 3. *Acanthomysis borealis*, n. sp. *a*, Anterior region, dorsal aspect; *b*, sixth thoracic leg; *c*, abdomen, lateral view; *d*, uropod (statocyst spines are on other side of inner uropod); *e*, telson; *f*, tip of telson. (*a*, *b*, *d*, *e*, scale A; *c*, scale B; *f*, scale C.)

Island, Alaska, described by me as *Acanthomysis* sp. in 1949. (In the description of this species [p. 102] there is a typographical error: the telson is 1.7 mm. long instead of 0.7 mm. long.) There are slight differences in proportions as, for example, those of the eyes, squame, and telson; the dorsal papilla of the ocular peduncle was not observed previously; and there are slight differences in the rugae and folds of the abdomen. But as the general configurations are similar and the distal end of the telsons are almost identical, and as the Kodiak specimen is markedly immature, the differences are not considered to be enough to warrant separation of the two forms.

The Kodiak specimen was left unnamed, as it was felt that without mature specimens too much faith should not be placed in its characteristics. This specimen shows that the distinguishing characteristics, especially the telson, are not influenced by growth. It is unfortunate that there are no mature males available, but the unique telson should be adequate to separate this species from related species, whether male or female specimens are examined.

As discussed under *A. alaskensis*, there are now seven species in the genus *Acanthomysis* with rugose abdomens. Some of the characteristics of those species are discussed under *A. alaskensis;* here it will suffice to say that all other members of the group have plainly truncate telsons with relatively straight sides immediately proximal to the truncation and that in all of them the posterolateral spines of the telson are markedly larger than the spines immediately adjacent on the lateral margins. In this species, on the other hand, the posterior margin of the telson is so indecisively truncate that it appears rounded, and the posterolateral spines are only slightly larger than the adjacent spines. Other characteristics can be used to supplement these differences—the large medial spines found on the tip of the telson in *A. sculpta*, the dorsoventrally compressed eye in *A. alaskensis*, etc. (see Table 1).

Thysanoessa raschi (M. Sars)

Thysanopoda raschii M. Sars, Vidensk. Selsk. Christiania, Forhandl., 1863, p. 83.

Thysanoessa raschii Banner, Roy. Canad. Inst., Trans. 28: 27, pl. 3, figs. 22a–b, 1950. [Includes synonymy.]

SPECIMENS EXAMINED: *Arctic Research Laboratory:* No. 341, plankton tow off Point Barrow, July 25, 1948; MacGinitie, collector. Four specimens.

No. 482, washed ashore near Point Barrow, Sept. 20, 1949; MacGinitie, collector. Six specimens.

No. 661, same as No. 482, Sept. 20, 1949. One specimen.

No.?, plankton tow near Point Barrow, Alaska, 1:30 P.M., Oct. 31, 1949; MacGinitie, collector. One specimen.

No.?, from gullet of Sabine gull, Elson Lagoon, Point Barrow, Alaska, Oct. 31, 1949; MacGinitie, collector. One specimen.

No. 489, Point Barrow Base, Alaska, July 24, 1950; Wiggins, collector. Eight specimens.

King Crab Investigation: C-108, C-109, Point Moller, Alaska, May 6, 1941, thousands of specimens from the stomachs of about 15 cod (*Gadus macrocephalus*) each on two separate samplings. Some of the cod had between 500 and 1,000 euphausids in their stomachs.

C-117, C-119, Cape Seniavin, Alaska, May 8, 9, 1941, less than 1,000 specimens from one pollock (*Theragra chalcogramma*) and three cod stomachs.

DISCUSSION: The specimens listed are within the previously known range. It is notable that no other euphausid was found in the cod and pollock stomachs. This is similar to the role *Thysanoessa inermis* (Krøyer) played in the food of the 23 whales from Akutan (Banner, 1950: 27). The difference in food may be due to the fact that *T. raschi* is an inshore species, whereas *T. inermis* is more commonly found beyond the margin of the continental shelf.

Thysanoessa longipes Brandt

Thysanoessa longipes Brandt, Middendorff's Reise . . . 2(1): 128, pl. 6, figs. 1–4, 1851.

——— ——— Banner, Roy. Canad. Inst., Trans. 28: 21, 1950.

SPECIMENS EXAMINED: *Arctic Research Laboratory:* No. 662, washed ashore, Point Barrow, Sept. 26, 1949; MacGinitie, collector. One specimen.

No. 663, same data as above, Sept. 27, 1949. About 25 specimens, all immature.

No.?, same data as above, July 20, 1950. Two specimens.

DISCUSSION: This species was known previously from the Point Barrow region on the basis of only two specimens reported by Schmitt (1919: 8b).

Thysanoessa inermis (Krøyer)

Thysanopoda inermis Krøyer, Gaimard's Reise, pl. 7, fig. 2a, 1846.

Thysanoessa inermis Banner, Roy. Canad. Inst., Trans. 28: 24, pl. 3, figs. 23a–b, 1950. [Includes synonymy.]

SPECIMENS EXAMINED: *Arctic Research Laboratory:* No.?, along shore, Point Barrow Base, July 20, 1950; MacGinitie, collector. One specimen.

No.?, gullet, Sabine gull, Elson Lagoon, Point Barrow, Aug. 26, 1950; MacGinitie, collector. Three or four specimens, fragmentary.

No. 489, beach at Point Barrow Base, July 24, 1950; Wiggins, collector. One specimen.

DISCUSSION: This species also was reported from the Point Barrow region by Schmitt (1919: 8b).

TYPE MATERIAL OF PREVIOUSLY DESCRIBED SPECIES

In my previous study of mysids and euphausids from this region, I published names and descriptions of a number of new species for which I did not designate any particular specimen as the type for the species. The type specimens have now been selected from the series that were used in drawing up the descriptions (lectotypes, therefore, from a co-

typic series) and have been deposited in the United States National Museum. The following is the pertinent information about these types.

MYSIDACEA

Boreomysis kincaidi Banner (1948*a:* 362). International Fisheries Commission haul 2005c, 51°15′N., 130°25′W., 700, 800, 900 M., Mar. 19, 1941. U. S. N. M. 95627.

Euchaetomeropsis pacifica Banner (1948*a:* 386). International Fisheries Commission haul 1911a, 51°00′N., 130°00′W., 100, 200, 300 M., Dec. 31, 1940. U. S. N. M. 95628.

Caesaromysis vanclevei Banner (1948*a:* 389). Type (male): International Fisheries Commission haul 22b, 58°59′N., 150°58′W., 150, 250 M., Jan. 30, 1928. U. S. N. M. 95629.

Allotype (female): International Fisheries Commission haul 1267c, 52°00′N., 130°-24′W., 700, 800, 900 M., Jan. 7, 1935. U. S. N. M. 95630.

Acanthomysis nephrophthalma Banner (1948*b:* 93). Type (male): International Fisheries Commission haul 1284c, 53°47′N., 134°-02′W., 700, 800 M., Jan. 10, 1935. U. S. N. M. 95631.

Allotype (female): Same as type. U. S. N. M. 95632.

Acanthomysis davisi Banner (1948*b:* 95). Type (male): Friday Harbor, Washington, surface waters near shore, Aug. 2, 1937, collected by Charles C. Davis. U. S. N. M. 95633.

Allotype (female): Same as type. U. S. N. M. 95634.

Acanthomysis sculpta (Tattersall) var. *nuda* Banner (1948*b:* 100). Makah Bay, Washington, shallow water near beach, Sept. 4, 1940, collected by A. H. Banner. (Note: this is not a subspecies but the designation of an infrasubspecific entity.) U. S. N. M. 95635.

Mysidella americana Banner (1948*b:* 109). International Fisheries Commission haul 1935b, 52°00′N., 131°14′W., 500, 600 M. (net hit bottom), Jan. 13, 1941. U. S. N. M. 95636.

EUPHAUSIACEA

Thysanopoda dubia Banner (1950: 9). International Fisheries Commission haul 1997a, 51°41′N., 131°02′W., 100, 200, 300 M., Feb. 17, 1941. U. S. N. M. 95637.

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